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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/724,154	12/01/2003	Kohei Yoshida	117923	1598
25944	7590	11/01/2005	EXAMINER	
OLIFF & BERRIDGE, PLC P.O. BOX 19928 ALEXANDRIA, VA 22320			TRAN, BINH Q	
			ART UNIT	PAPER NUMBER
			3748	

DATE MAILED: 11/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/724,154

Applicant(s)

YOSHIDA ET AL.

Examiner

BINH Q. TRAN

Art Unit

3748

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 August 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This office action is in response to the amendment filed August 18, 2005.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-6, 8-10, 12-13, and 15-20 are rejected under 35 U.S.C. 102 (b) as being anticipated by Hirota et al. (Hirota) (Patent Number 6,233,925).

Regarding claims 1, 8, 12, 15, 18, and 20, Hirota discloses an exhaust emission control apparatus for an internal combustion engine (1) comprising: an NOx catalyst (10) disposed in an exhaust passage of said internal combustion engine; a temperature raising section for raising the temperature of said NOx catalyst (e.g. See col. 14, lines 48-67); a first reducing agent supplying section for supplying a reducing agent to said NOx catalyst when an amount of nitrogen oxides occluded in said NOx catalyst becomes more than or equal to a predetermined amount (e.g. See col. 13, lines 6-63); and a second reducing agent supplying section for supplying an amount of said reducing agent more than that supplied by said first reducing agent supplying section to said NOx catalyst before said temperature raising section is operated to raise the temperature of said NOx catalyst (e.g. See col. 15, lines 1-67; col. 16, lines 1-59).

Regarding claims 2, 9, 16, and, 19, Hirota further discloses that the nitrogen oxides reducing section comprises a reducing agent supplying section for supplying a reducing agent to said NOx catalyst (e.g. See col. 15, lines 1-67; col. 16, lines 1-59).

Regarding claims 3 and, Hirota further discloses that the reducing agent supplying section supplies said reducing agent to said NOx catalyst (10) by performing the sub-injection of fuel on at least one of an intake stroke, an expansion stroke and an exhaust stroke of said internal combustion engine (e.g. See Fig. 15; col. 15, lines 1-67; col. 16, lines 1-59).

Regarding claims 4 and, Hirota further discloses that the reducing agent supplying section supplies said reducing agent to said NOx catalyst (10) by adding said reducing agent to an exhaust from a reducing agent addition valve (e.g. 124, 126) disposed on said exhaust passage (9) of said internal combustion engine (e.g. See Figs. 17-21; col. 18, lines 56-67; cols. 19-20, lines 1-67).

Regarding claims 5, and 17, Hirota further discloses an estimating section for estimating the amount of nitrogen oxides occluded in said NOx catalyst, wherein when the amount of nitrogen oxides estimated by said estimating section is less than a predetermined amount, said nitrogen oxides reducing section does not reduce the amount of said nitrogen oxides occluded in said NOx catalyst (e.g. See Fig. 5; col. 7, lines 45-67; col. 8, lines 1-49).

Regarding claims 6, 10, and 13, Hirota further discloses that the temperature raising section raises the temperature of said NOx catalyst when poisoning of said NOx catalyst due to sulfur oxide is removed (e.g. See col. 15, lines 1-67; col. 16, lines 1-59).

Claims 1-20 are rejected under 35 U.S.C. 102 (b) as being anticipated by Hirota et al. (Hirota'791) (Patent Number 5,974,791).

Regarding claims 1, 8, 12, 15, 18, and 20, Hirota'791 discloses an exhaust emission control apparatus for an internal combustion engine (1) comprising: an NOx catalyst (e.g. 10, 53) disposed in an exhaust passage of said internal combustion engine; a temperature raising section for raising the temperature of said NOx catalyst (e.g. 10, 53) (e.g. See col. 8, lines 6-67; col. 9, lines 1-46); a first reducing agent supplying section for supplying a reducing agent to said NOx catalyst when an amount of nitrogen oxides occluded in said NOx catalyst becomes more than or equal to a predetermined amount (e.g. See col. 8, lines 6-67; col. 9, lines 1-46); and a second reducing agent supplying section for supplying an amount of said reducing agent more than that supplied by said first reducing agent supplying section to said NOx catalyst before said temperature raising section is operated to raise the temperature of said NOx catalyst (e.g. See col. 12, lines 24-67; cols. 13-14, lines 1-67).

Regarding claims 2 and 16, Hirota'791 further discloses that the nitrogen oxides reducing section comprises a reducing agent supplying section (12) for supplying a reducing agent to said NOx catalyst (e.g. See col. 7, lines 1-42-67; col. 8, lines 1-67).

Regarding claims 3, 9, and 19, Hirota'791 further discloses that the reducing agent supplying section supplies said reducing agent to said NOx catalyst (e.g. 10, 53) by performing the sub-injection of fuel on at least one of an intake stroke, an expansion stroke and an exhaust stroke of said internal combustion engine (e.g. See col. 12, lines 24-67; cols. 13-14, lines 1-67).

Regarding claim 4, Hirota'791 further discloses that the reducing agent supplying section supplies said reducing agent to said NOx catalyst (e.g. 10, 53) by adding said reducing agent to

an exhaust from a reducing agent addition valve (e.g. 12) disposed on said exhaust passage (6) of said internal combustion engine (e.g. See col. 7, lines 1-42-67; col. 8, lines 1-67).

Regarding claims 5 and 17, Hirota'791 further discloses an estimating section for estimating the amount of nitrogen oxides occluded in said NOx catalyst, wherein when the amount of nitrogen oxides estimated by said estimating section is less than a predetermined amount, said nitrogen oxides reducing section does not reduce the amount of said nitrogen oxides occluded in said NOx catalyst (e.g. See col. 10, lines 22-67; col. 11, lines 1-29).

Regarding claims 6, 10, and 13, Hirota'791 further discloses that the temperature raising section raises the temperature of said NOx catalyst when poisoning of said NOx catalyst due to sulfur oxide is removed (e.g. See col. 12, lines 24-67; cols. 13-14, lines 1-67).

Regarding claims 7, and 14, Hirota'791 further discloses that the NOx catalyst comprises: an NOx occlusive agent being operable to occlude said nitrogen oxides in an exhaust when the air fuel ratio of the exhaust flowing into the NOx catalyst is lean, and discharge the occluded nitrogen oxides when the oxygen concentration of the exhaust flowing into the NOx catalyst is reduced (e.g. See col. 10, lines 22-67; col. 11, lines 1-29); and a particulate filter (e.g. 10, 91) for collecting particulate matter in said exhaust; wherein said temperature raising section raises the temperature of said NOx catalyst when said particulate matter collected by said particulate filter is removed (e.g. See col. 12, lines 24-67; cols. 13-14, lines 1-67).

Response to Arguments

Applicant's arguments filed August 18, 2005 have been fully considered but they are not completely persuasive. **Claims 1-20 are pending.**

Applicant's cooperation in explaining the claims subject matter more specific to overcome the claim rejection is appreciated.

Applicants have argued that Hirota does not teach or suggest Applicants's claimed invention. More specifically, Applicants assert that the reference to Hirota fails to disclose the step of *"a nitrogen oxides reducing section for reducing an amount of nitrogen oxides occluded in said NOx catalyst before said temperature raising section is operated to raise the temperature of said NOx catalyst; and a second reducing agent supplying section for supplying an amount of said reducing agent more than that supplied by said first reducing agent supplying section to said NOx catalyst before said temperature raising section is operated to raise the temperature of said NOx catalyst"*. The examiner respectfully disagrees, in column 14, lines 48-67; and columns 15-16, lines 1-67, Hirota has clearly disclosed that *"To discharge SOx absorbed by the NOx catalyst, it is necessary to make the air-fuel ratio of the exhaust gas stoichiometric or rich, to increase the catalysis temperature of the NOx catalyst compared with that in normal regeneration in which NOx is discharged from the NOx catalyst and to realize presence of the oxygen. To do this, therefore, if SOx is discharged from the NOx catalyst, sub-fuel injection is conducted to inject fuel into the cylinder in the expansion or discharge process of the engine 1 as in the case of NOx discharge, thereby making the air-fuel ratio of the exhaust gas flowing into the NOx catalyst 10 stoichiometric or rich. Next, the function of the exhaust discharge control device in a fourth embodiment will be described with reference to FIG. 9. As described above, since the engine main body 1 is a diesel engine, the air-fuel ratio of the exhaust gas therein is lean and oxygen concentration is high during normal operation. Therefore, if this exhaust gas flows into the NOx catalyst 10, NOx in the exhaust gas is absorbed by the NOx catalyst 10. ...*

Further, as described above, it is necessary to make the catalysis temperature higher than that during NOx discharge so as to discharge SOx from the NOx catalyst 10. In the above NOx discharge processing, however, SOx cannot be discharged from the NOx catalyst 10.... SOx needs to be released when the catalysis temperature is high. To ensure high catalysis temperature, the EPU 20 may control SOx release processing such that the processing is executed at a timing of the acceleration operation or high load operation of the engine 1. Alternatively, the ECU 20 may control the operating state of the engine 1 so as to positively increase exhaust gas temperature during SOx discharge processing. In either case, the ECU 20 executes SOx discharge processing while the catalysis temperature of the NOx catalyst 10 falls within the range suited for SOx discharge processing. As already described, the SOx discharge processing needs to be conducted while the catalysis temperature is higher than that in the NOx discharge processing. If the sub-injection of the fuel is conducted in the same manner as NOx discharge processing under the temperature conditions, oxygen contained in the exhaust gas is consumed while the exhaust gas flows in the upstream region of the catalytic converter 11 and no oxygen exists in the downstream region of the catalytic converter 11. Due to this, the downstream region cannot be kept under an SOx dischargeable atmosphere. ... If the intermittent sub-injection is executed and the total rich atmosphere is provided up to the downstream end of the catalytic converter 11 as described above, it is possible to discharge and reduce SOx absorbed by all of the NOx catalysts 10 in the catalytic converter 11 and discharge SOx as SO2 to the air. It is noted that NOx absorbed by the NOx catalysts 10 is discharged and reduced, and then discharged as N2 at a time of executing SOx discharge processing. Even if intermittent sub-injection is executed for discharging SOx as stated above, there is a possibility

that oxygen is consumed while the exhaust gas flows in the upstream region of the catalytic converter 11 if the temperature of the NOx catalyst 10 in the upstream region of the catalytic converter 11 is too high. To avoid this, SOx discharge processing may be executed when the temperature of the front end portion of the catalytic converter 11 decreases (such as, for example, during deceleration or idling operation) to allow ensuring an oxygen existing atmosphere in the downstream region of the catalytic converter 11. When the temperature of the front end portion of the catalytic converter 11 decreases, the temperature of the back end portion thereof increases. Thus, as SOx starts to be discharged and reduced from the NOx catalyst 10 at the back end and the temperature of the back end increases, the SOx discharge and reduction operation spreads to the front end portion of the catalytic converter 11. As seen from the above, according to the exhaust discharge control device in this embodiment, it is possible to discharge and reduce the SOx absorbed by the NOx catalyst 10 surely and sufficiently. As a result, it is possible for the catalytic converter 10 to sufficiently recover its NOx absorbing capability. ... In the above embodiment, intermittent sub-injection is employed as means for providing a total rich atmosphere up to the downstream end of the catalytic converter 11. In a fifth embodiment shown in FIG. 16, the total rich atmosphere is provided in the downstream region by conducting sub-injection continuously and supplying secondary air to the downstream region of the catalytic converter 11 “. It is well understood that when the air-fuel ratio of the exhaust gas flowing into the NOx catalyst is stoichiometric or rich, the nitrogen oxides is reduced, and the temperature of the NOx catalyst is raised . Accordingly, Hirota has clearly disclosed a nitrogen oxides reducing section for reducing an amount of nitrogen oxides occluded in the NOx catalyst before the temperature raising section is operated to raise the temperature of the NOx catalyst, and a

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second reducing agent supplying section for supplying an amount of the reducing agent more than that supplied by the first reducing agent supplying section to the NOx catalyst before the temperature raising section is operated to raise the temperature of the NOx catalyst.

Moreover; Applicants have argued that Hirota'791 does not teach or suggest Applicants's claimed invention. More specifically, Applicants assert that the reference to Hirota'791 fails to disclose the step of "a nitrogen oxides reducing section for reducing an amount of nitrogen oxides occluded in said NOx catalyst before said temperature raising section is operated to raise the temperature of said NOx catalyst; and a second reducing agent supplying section for supplying an amount of said reducing agent more than that supplied by said first reducing agent supplying section to said NOx catalyst before said temperature raising section is operated to raise the temperature of said NOx catalyst". The examiner respectfully disagrees, in column 14, lines 48-67; and columns 15-16, lines 1-67, Hirota'791 has clearly disclosed that "*When the operation starts, in FIG. 2, at step 201, ... the ECU 30 further determines whether the amount of SOx absorbed in the DPF 10a has increased to a predetermined value based on the value of a SOx counter CSA at step 203. CSA is a counter representing the amount of SOx absorbed in the DPF 10a and the value thereof is set by the operation in FIG. 4 which will be explained later. If the value of CSA reaches a predetermined value CSo at step 203, i.e., if the amount of SOx absorbed in the operating DPF 10a has increased to a predetermined value, the ECU 30 switches the switching valve 9 to the position where all the exhaust gas is directed to the other DPF 10b at step 205. In this case, the ECU 30 further supplies electricity to the DPF 10a to raise the temperature of the DPF 10a to above a predetermined temperature (about 500 °C and*

preferably 600 °C) and supplies reducing agent to the DPF 10a from the reducing agent supply unit 12. Thus, the DPF 10a is isolated from the exhaust gas flow and exposed to a high temperature in a lean air-fuel ratio atmosphere and, thereby, the absorbed SOx is released from the DPF 10a. This SOx recovery operation is continued for a predetermined period at step 209. The period for continuing the SOx recovery operation is a period sufficient for releasing the amount of the absorbed SOx (i.e., the amount corresponding to the value CS₀ of the SOx counter) and determined by experiment. After performing the SOx recovery operation for the predetermined period, the ECU 30 clears the value of the SOx counter CSA at step 211. ... If CSA < CS_{sub.0} at step 203, i.e., if the SOx recovery operation of the DPF 10a is not required, the ECU 30 executes step 223 to determine whether the NOx releasing operation of the DPF 10a is required. At step 223, it is determined whether the value of a NOx counter CNA has increased to a predetermined value CN_{sub.0}. The NOx counter CNA represents the amount of NOx absorbed in the DPF 10a, and is set by the operation in FIG. 4. If CNA ≥ CN_{sub.0} at step 223, since this means that the NOx releasing operation of the DPF 10a is required, the ECU 30 isolates the DPF 10a from the exhaust gas by switching the switching valve 9 to the position where the exhaust gas is directed to the DPF 10b at step 225, and supplies the reducing agent to the DPF 10a from the nozzle 12a of the reducing agent supply unit 12 at step 227. Thus, the DPF 10a is exposed to a relatively low temperature and a rich air-fuel ratio atmosphere to perform the NOx releasing operation. At step 227, the NOx releasing operation is continued for a predetermined period. The period for continuing the NOx releasing operation is a period required for releasing the amount of NOx absorbed in the DPF 10a (the amount corresponding to the value CN_{sub.0} of the counter CNA), and

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determined by experiment. When the predetermined period elapsed, the ECU 30 stops the supply of the reducing agent at step 230, and clears the value of the NO_x counter CNA of the DPF 10a at step 231. When the NO_x releasing operation of the DPF 10a is completed, the DPF 10a is reserved in this condition until the switching valve 9a is switched to the position where the exhaust gas is directed to the DPF 10a. If $CNA < CN.sub.0$ at step 223, i.e., if the NO_x releasing operation of the DPF 10a is not necessary, the ECU 30 immediately stops the operation, and the NO_x absorption and the collection of the particulate matter by the DPF 10a is continued. ... ”.

It is well understood that when the air-fuel ratio of the exhaust gas flowing into the NO_x catalyst is stoichiometric or rich, the nitrogen oxides is reduced, and the temperature of the NO_x catalyst is raised. Accordingly, Hirota has clearly disclosed a nitrogen oxides reducing section for reducing an amount of nitrogen oxides occluded in the NO_x catalyst before the temperature raising section is operated to raise the temperature of the NO_x catalyst, and a second reducing agent supplying section for supplying an amount of the reducing agent more than that supplied by the first reducing agent supplying section to the NO_x catalyst before the temperature raising section is operated to raise the temperature of the NO_x catalyst.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be

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calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Binh Tran whose telephone number is (571) 272-4865. The examiner can normally be reached on Monday-Friday from 8:30 a.m. to 5:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas E. Denion, can be reach on (571) 272-4859. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and for After Final communications.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

BT
October 27, 2005



Binh Q. Tran
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Art Unit 3748